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Original Article

Understanding Heterogeneity in the Effects of Parental Separation on Educational Attainment in Britain: Do Children from Lower Educational Backgrounds Have Less to Lose?

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Abstract

We use the British Cohort Study 1970 to show that the proportion of children achieving a tertiary education degree is 8 percentage points lower for the offspring of separated parents than for children from intact families. Moreover, the children of highly educated parents experience a two times larger 'separation penalty' than the children of less educated parents. We find a similar pattern of heterogeneity in effects for the likelihood of participation in academic education (A-Levels) beyond school leaving age but not for school grades at age 16. We test three different explanations for heterogeneity in the parental separation penalty: changes in family relations, changes in income, and negative selection into separation based on unobserved characteristics. We address the potential endogeneity of parental separation by including pre-separation observable characteristics, individual fixed effects models, and a placebo test. Our key finding is that changes in family income, but not those in family relations or selection, explain a large part of heterogeneity in the effects of parental separation. Children with more highly educated parents face a larger decline in family income if parents separate and, in addition, declines in family income of equal amounts entail more negative consequences for their educational attainment.

In recent years, an interesting finding has surfaced in the literature addressing the effects of parental separation on child outcomes. Several studies have found that parental separation has a greater impact on the educational and occupational attainment of children from socio-economically advantaged backgrounds than on the attainment of their counterparts from more disadvantaged backgrounds (Biblarz and Raferty, 1993; McLanahan and Sandefur, 1994; Martin, 2012).[1] This seems a surprising result. Studies in social stratification have shown that children from advantaged socio-economic backgrounds are less affected by previous negative outcomes and disadvantageous life events that might hinder their future prospect of educational attainment (cf. Bernardi 2014). These 'compensatory effects' in education are often held responsible for the lack of downward mobility of children from higher socio-economic backgrounds (Boudon, 1998). Understanding why such 'compensatory effects' are absent in the case of parental separation could enhance our understanding of the processes that

determine the intergenerational transmission of social advantage, and, moreover, will increase our understanding of the effects of parental separation on child outcomes.

We use data from the 1970 British Cohort Study (BCS) to investigate heterogeneity in the effects of parental separation on three educational outcomes: grades at age 16, participation in post-compulsory secondary academic education (i.e. A-Levels) and having a university degree at age 30. Previous studies on Britain have shown that the rate of parental separation is among the highest in Europe (Del Boca, 2003) and that children's educational attainment is negatively associated with parental separation (McLanahan *et al.*, 2013). The effect of social background on children's educational attainment is also well documented (Erikson *et al.*, 2005). These characteristics make Britain a suitable case to study whether, and if so why, the impact of parental separation on educational outcomes is larger for children from advantaged backgrounds.

Our contributions are twofold: First, we document a larger parental separation penalty for socio-economically advantaged children in terms of academic participation beyond school leaving age and for achieving a university degree, but not in terms of grades at age 16. These results are confirmed by a series of robustness checks that include an identical analysis on a different data set for university attainment (Understanding Society). We also address potential endogeneity issues by estimating an individual fixed effects model and by including observed pre-separation factors. We also perform a 'placebo test' for the analysis on grades and the transition to post-compulsory secondary academic education at age 16 by looking at the effects of parental separations that took place shortly after the outcomes were measured (Adda *et al.*, 2011).

Secondly, we outline and empirically examine different mechanisms that could underlie the patterns observed. Our results suggest that heterogeneity in the effects of parental separation is brought about by lower levels of family income after separation (although our analysis does not allow for causal claims regarding the mechanisms at play). The reduction in income associated with a parental separation is larger and entails more negative consequences for children from higher socio-economic backgrounds. We conclude by emphasizing the key role of economic resources in the transmission of educational advantage across generations and discuss how our results could differ in other contexts.

Social Background and the Effects of Parental Separation

A well-established body of research has documented that parental separation is associated with worse socio-economic outcomes for children *on average*. Causally oriented designs often find smaller effects than raw associations, but a non-trivial effect remains (Amato, 2010; McLanahan *et al.*, 2013). In recent years, scholars have acknowledged that the consequences of parental separation might differ by parental socio-economic background (Biblarz and Raferty, 1993; McLanahan and Sandefur, 1994; Jonsson and Gähler, 1997; Cavanagh and Huston, 2006; Fischer, 2007; Albertini and Dronkers, 2009; Martin, 2012; Augustine, 2014; Mandemakers and Kalmijn, 2014; Grätz, 2015).

Based on earlier studies on how families deal with disadvantages experienced by their children, one would expect resourceful parents to be able to dampen down the negative effects of parental separation (Bernardi, 2014). The social, cultural, and economic resources of advantaged families might help maintaining the financial conditions and parenting styles that are favourable to children's outcomes. However, several studies have found that the final educational attainment of children from socio-economically advantaged families is more negatively affected by parental separation than the attainment of disadvantaged children (Biblarz and Raferty, 1993; McLanahan and Sandefur, 1994; Martin, 2012; Bernardi and Radl, 2014).

We distinguish three broad categories of mechanisms that might explain why the separation penalty in educational attainment could be larger for children from socio-economically advantaged families: changes in family relations, changes in income, and negative selection into separation based on unobserved characteristics.

First, parental separation affects family relations through changes in time spent with children and conflict between parents. Highly educated parents could be more likely to re-partner (Sweeney, 2007) and are more often in conflict with each other post-separation (Kalil *et al.*, 2011). Parental separation by highly educated parents might therefore entail more negative consequences for the psychological well-being of children. Moreover, studies of parenting styles have made the distinction between a 'concerted cultivation' model, prevalent among highly educated parents, and an 'accomplished natural growth' model, prevalent among less educated parents (Lareau, 2003). The concerted cultivation model consists of parents being strongly involved in the organization of children's extra-curricular activities and actively transmitting values and knowledge. Conversely, the accomplished natural growth model is characterized by parents being less involved in structuring after school activities and having less time and education to impress values on them. For single parents, the difficulties of combining work and family life could reduce ability to

maintain a 'concerted cultivation' parenting model. If that is the case, and advantaged children are more often raised under such a regime, children from advantaged backgrounds are more likely to experience a change in parenting style in case of a parental separation, compared to children from disadvantaged backgrounds.

A second mechanism that might interfere with the transmission of advantage across generations is economic capital. Parental separation can affect economic investments in children due to direct divorce costs, the loss of combined household scale advantages, and the redirection of resources towards new family members (Amato, 2010). Whereas socio-economically advantaged families are likely to have higher economic resources after separation compared to more disadvantaged families, it could be that high pre-separation levels of resources also imply large absolute losses in resources due to separation. Moreover, losses in economic capital can also be more consequential for the attainment of socio-economically advantaged children. For instance, imagine the hypothetical situation that a given financial threshold has to be met to pursue higher education. If the income of family A is below the threshold before separation, a reduction in income associated with separation does not alter the opportunities to move on to higher education. In contrast, if the income of family B is above this threshold before separation, income might drop below the threshold following separation. In this hypothetical example the same income reduction is more consequential for the educational attainment of children of family B compared to children of family A. This intentionally stylized example illustrates that the marginal impact of income reduction may differ according to where a family is situated within the income distribution.

Both the discussion on changes in parenting styles and income can be aligned with a 'floor effects' hypothesis (Kalmijn, 2010; Bernardi and Radl, 2014), which states that children in disadvantaged families have less access to social, cultural, and economic resources to begin with, and therefore have less to lose from parental separation.

An entirely distinct explanation is endogeneity (McLanahan *et al.*, 2013). It could be that highly educated couples who separate are more selected on certain characteristics, for instance on high levels of conflict, that also negatively affect children's educational outcomes (Bernardi and Martínez-Pastor, 2010). Such characteristics are typically difficult to observe with available data. Observed patterns of heterogeneity in the consequences of parental separation could then be due to such unobserved characteristics.

Finally, stratification researchers have posited that social background affects final educational attainment through ability and performance at school on the one hand and through choices regarding specific school transitions on the other hand (Boudon, 1974). From this perspective, heterogeneity in effects of parental separation on children's educational attainment can come about through differential effects of parental separation on cognitive ability/school grades and on the choices made regarding continued participation in education. In other words, performance at school could worsen more after a parental separation for children of highly educated parents and/or the impact of parental separation might have a more negative effect on their decision to go to university. Our analysis will empirically distinguish between grades and transitions, enabling an exploration of the extent to which the different mechanisms discussed above operate through school performance and educational transitions.

Data, Variables, and Models

Data

We used data from the 1970 BCS, a longitudinal survey following a representative cohort of children born in April 1970 through interviews at ages 0, 5, 10, 16, 26, 30, 34, 38, and 42 (see http://www.cls.ioe.ac.uk/). Data were collected from parents at ages 0, 5, 10, and 16, and from children from age 5 onward. We selected all respondents who still lived with both their (biological or adopted) parents at age 5 and focused on separations after age 5 because at that age a set of pre-separation characteristics is available in the data. Results were robust to the inclusion of separations experienced before age 5 (results available upon request).

Subsequently, we selected all respondents who were still present in the survey at age 30, when educational attainment was measured.[2] Of all respondents still living with both parents at age five, 25.1% were lost due to attrition by age 30, whereas 0.4% of cases had to be left out because of missing information on the dependent variables. A robustness check based on the first wave (and therefore not affected by attrition) of the Understanding Society study provided the same patterns of heterogeneity as our main results from the 1970 BCS (see Supplementary Appendix A). In addition, we employed multiple imputation for missing data on all independent variables (Mostafa and Wiggins, 2015; see Supplementary Appendix B).

Variables

Educational attainment by age 30 was our main dependent variable, measured by a dummy variable of having attained a tertiary education qualification (International Standard Classification of Education categories 5–6) or not. In robustness checks, a measure based on years of education was used, and results did not change (available upon request).

To distinguish between the effects of parental separation on performance at school and educational transitions, we focused on the key point of educational careers in Britain around age 16 (Jackson *et al.*, 2007). At this age, pupils can choose to continue in an academic post-compulsory upper-secondary educational track called A-Levels, which, especially in the 1980s, was needed to maximize chances of progressing to university. Before this transition point, children took either the Certificate of Secondary Education (CSE) exams or exams called 'O-levels' (now replaced by the GCSE exams) which were key determinants of access to A-Levels. Our two additional dependent variables were, then, CSE/O-levels grades at age 16 (Scottish O-grades for Scottish respondents) and whether children made the transition to A-Levels. Grades were measured as the position in the exam-type-specific grade distribution using a scoring system similar to Sullivan (2001).[3] Unfortunately, information on grades is not available for the entire sample. We therefore restricted the analysis on academic performance to the subsample with valid information on grades ($N = 6{,}699$).

The main independent variable was parental separation experienced between age 5 and 16. We coded experience of parental separation based on a question asked at age 30 about whether the respondents' parents had ever permanently divorced or separated, including both the dissolution of marital and cohabiting unions. Respondents who were born into single-parent families, who experienced the death of a parent, or whose parents separated after age 16 were excluded from the main sample because they did not experience a parental separation (or did not at the measurement of key independent variables). Comparing the consequences of different family transitions goes beyond the scope of this article.[4]

To look at heterogeneity in the effects of parental separation according to family background, we used a categorical measure based on a combination of both parents' educational level. The categories were (i) both parents have no qualifications (ISCED 1-2, max lower secondary education), (ii) only the father has some qualifications, (iii) only the mother, and (iv) both have more than ISCED 1-2 education. We estimated a robustness check using two separate measures for paternal and maternal education, both being dummies of whether the parent had any qualifications or not. Results were robust to these specifications. We also used a different specification that focused on the top end of the distribution (none tertiary education; mother ISCED 5-6; father ISCED 5-6; both ISCED 5-6). Results differed to some extent and are discussed in the text.

To control for pre-existing differences in economic resources, we included a measure of material disadvantage at age 5 based on standardizing the sum of positive answers on whether parents owned their home, the household had various kinds of durables, how their neighbourhood was rated, and how well equipped the house was ($\alpha = 0.72$). We also included a measure of maternal psychological well-being based on 25 questions regarding her psychological problems when the respondent was 5 years old. Previous studies have shown that family conflict is an important predictor of maternal psychological well-being (Demo and Acock, 1996; Kim and McKenry, 2002).

We included measures of cognitive ability and behavioural problems at age 5, which could catch overall pre-existing differences in the chances of success in the educational system (its correlation with our measure of cognitive ability at age 16 is 0.37). The cognitive ability measure consisted of three tests (Human Figure Drawing Test; Copying Design Test; English Picture Vocabulary Test), combined into one factor measuring general cognitive ability using factor analysis (Feinstein, 2003). Behavioural problems were captured by summing positive answers of the mother to 38 questions regarding behaviour, physical and psychological problems of the child.[5]

As a second step, we looked at the role of family relations and economic capital at age 16. Ideally, we would measure changes in resources between age 5 and 16, but identical measures were not available across waves. We therefore relied on a strategy where we controlled for important characteristics at age 5 and looked at the effects of variables at age 16 net of these controls.

To analyse the influence of family relations and parenting, we considered the parent–child relationship, parental involvement in school, parental monitoring, and post-separation family structure at age 16. One would ideally include measures of the involvement of resident and non-resident parents separately, but these were not available. We expected non-resident parents' involvement to be reflected in the questions about parent involvement in general. A measure of the parent–child relationship was included using 11 questions such as 'My parents don't understand me/my motives' or 'My

parents are helpful/good in a crisis' (by standardizing the sum of all scores; $\alpha = 0.73$). School involvement of the parents was measured by a dummy variable of whether one of the parents had visited their child's school in the last year. We used a battery of questions to measure parental monitoring which consisted of 23 questions asked to respondents regarding their parents' monitoring, such as 'Parents expect me to tell them who I am with', we summed the positive responses to each question and standardized the variable. Finally, we looked at whether respondents who experienced separation reported living with a step-mother or step-father, and whether they lived with the father or the mother following separation based on the respondents' household structure at age 16. Data limitations prevented us from looking at post-separation family structure at later ages. In additional analysis, we also looked at children's psychological adjustment to parental separation at age 16. Psychological well-being would be a separate child outcome to study but could also explain variation in educational attainment. However, the inclusion of a psychological well-being scale at age 16 (based on 19 questions) as an explanatory variable did not affect results (available upon request).

To measure economic resources we looked at material disadvantage and family income at age 16. Material disadvantage was a composite variable based on several indicators of the material well-being of the household the mother of the respondent lives in ($\alpha = 0.62$; see age 5 measure above). A measure of standardized annual household income (from the 'mother and father' of the child, asked to the mother) seemed to tap into a different underlying concept (possibly, material disadvantage is more related to wealth than income) and was therefore retained as a separate measure within the material resources category. Descriptive statistics for all variables are reported in Table 1.

Models

We started by estimating whether there is a penalty related to parental separation in terms of tertiary educational attainment and interacted it with parental education. We used Linear Probability Models (LPM) with robust standard errors (Mood, 2010). Our patterns of heterogeneity were practically identical once estimated through average marginal effects based on logistic regression. We subsequently looked at the possible influence of endogeneity, i.e. of factors that could affect both parental separation and children's educational attainment. Previous studies have shown that parental separation is more prevalent among lower educated parents (Chan and Halpin, 2005), something that is also true for our sample (See Table 1). Families with high levels of education who break up could therefore be relatively more selected on negative traits, such as family conflict, compared to families with lower levels of education. These traits are not always observable, increasing the importance of looking at the influence of endogeneity on results.

We employed different strategies following previous studies that have attempted to estimate the causal effect of parental separation (Sanz-de-Galdeano and Vuri, 2007; Francesconi *et al.*, 2010; Mencarini *et al.*, 2012; Cooper *et al.*, 2011). First, we included a set of pre-separation observables (i.e. material resources, mother's psychological problems, child's behavioural problems and cognitive ability at age 5, see Table 1) to control for differences between groups of children that are observable already before parental separation. We used coarsened exact matching on these pre-separation observables to reweight the analysis and drop cases for which no 'counterfactual' case exists in the data (Iacus *et al.*, 2011). Second, we estimated individual fixed effects models by looking at differences in cognitive ability between ages 5, 10, and 16 (Cooper *et al.*, 2011). Finally, we performed a 'placebo test' (Adda *et al.*, 2011; McLanahan *et al.*, 2013) where we analysed the relationship between parental separations that occurred between ages 17 and 19 and academic performance and educational choices made at age 16 (i.e. before the parental separation took place). The logic of the placebo test was as follows. We compared the separation penalty for educational outcomes at age 16 for those who experienced parental separation between age 5 and 16 and for those who experienced it between age 17 and 19 (placebo). If the observed negative association between parental separations between age 5 and age 16 and children's educational outcomes at age 16 is driven by unobserved family characteristics and if these characteristics can be assumed to be relatively constant over time, we should also observe a negative association between the educational outcomes at age 16 and the parental separations that occurred *after* age 16. Conversely, if parental separations *after* age 16 are not related to educational outcomes at age 16, we can in principle exclude the possibility that unobserved family characteristics that are constant over time underlie the observed associations between parental separation *before* age 16 and educational outcomes at age 16.[6] These different strategies cannot entirely rule out the influence of all (time-varying) unobserved factors on our estimates, but will give an indication of the role of several possible sources of endogeneity.

Table 1. Descriptive statistics of the BCS 1970 sample used in this study, $N = 9{,}525$

	Avg.	SD	Min.	Max.	% Miss.	% Separated	Amount separated
Completion of tertiary education at age 30	0.28		0	1	0		
Parents separated between age 5 and 16	0.14		0	1	1.6		
Neither parent more than ISCED 1-2	0.35		0	1	2.9	15.2	458
Only mother completed more than ISCED 1-2	0.19		0	1	2.9	18.3	160
Only father completed more than ISCED 1-2	0.10		0	1	2.9	14.5	242
Both parents completed more than ISCED 1-2	0.36		0	1	2.9	11.8	376
Material Resources age 5	0.14	0.92	−4.67	2.19	17.1		
Child's cognitive ability at age 5	0.11	1.26	−4.47	4.23	23.5		
Mother's psychological problems age 5	−0.07	0.96	−1.20	5.02	18.1		
Child's behavioural problems at age 5	−0.07	0.96	−1.72	4.47	17.6		
Child's school grades percentile age 16	0.53	0.32	0	1	32.0		
Made transition to A-levels age 16	0.45		0	1	0.01		
Material Resources age 16	0.10	0.92	−4.75	1.86	33.0		
Standardized annual household income age 16	0.07	0.99	−1.48	2.65	49.9		
Parent–child relationship age 16	0.01	1	−3.61	1.12	53.7		
Parents visited school age 16	0.57		0	1	36.9		
Parental monitoring age 16	0.02	0.98	−2.27	2.00	56.4		

Note: Avg. = average; SD = standard deviation; Min. = minimum; Max. = maximum; Miss. = % of sample used that had missing information and thus multiply imputed values (20) used in the analysis. All continuous variables standardized, deviations from mean = 0, and standard deviation = 1 due to cases dropped with missing values on other variables.

As a last step, we looked at the role of different mechanisms by including blocks of variables measuring family relations and economic resources at age 16. Our analysis on mechanisms does not have a causal underpinning, and should therefore be interpreted on the associational level (Imai *et al.*, 2011).

Findings

Table 2 shows the effects of parental separation on the educational attainment of respondents at age 30 (Model 1), as well as its interaction with parental education (Model 2). Those whose parents separated between ages 5 and 16 are 8 percentage points less likely to obtain a tertiary education qualification (for an analysis by age at parental separation see Supplementary Appendix F). Given that in total 28 per cent of respondents held a tertiary education qualification, the 'parental separation penalty' corresponds to a reduction in tertiary education attainment of about one third. The effect size seems considerable although notably smaller if compared to the effect of parental education.

The 'parental separation penalty' is not equal across social backgrounds. Higher parental education is associated with a larger negative effect of separation on child outcomes. Individuals with parents who are both highly educated suffer a separation penalty twice as large as those with parents who have at most attained lower secondary education. More precisely, the separation penalty is 12.6 percentage points for the children of highly educated parents, whereas the corresponding figure is 6.2 percentage points for the children of less educated parents. In robustness checks (not shown), we focused on the top of the educational distribution. The 5 per cent of children whose parents are both university graduates are only affected slightly more than the children of two non-graduate parents.

Once controlling for pre-existing differences in mothers' psychological problems, material resources, respondents' behavioural problems and cognitive ability at age 5, we observe that the constitutive term for separation decreases by 2.5 percentage points (see Model 3). At the same time, heterogeneity in the 'separation penalty' does not change. The same conclusion holds for Model 4 based on coarsened exact matching on the pre-separation observables.

Performance at School and Educational Transitions at Age 16

We continue by looking directly at the effects of parental separation on two main channels through which final educational attainment comes about: performance at school and the decision to move on to A-levels. Table 3 displays the effects of parental separation according to

Table 2. The effect of parental separation on tertiary educational attainment at age 30, LPM models

	Attainment of tertiary education		Attainment of tertiary education		Attainment of tertiary education		Attainment of tertiary education (matched)	
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Family situation (Ref. Intact two-parent family)								
Parental separation between age 5 and 16	−0.083**	0.012	−0.062**	0.014	−0.037*	0.014	−0.043*	0.021
Parental Education (Ref. Both ISCED 1-2)								
Only father has more than ISCED 1-2	0.096**	0.012	0.095**	0.013	0.051**	0.013	0.094**	0.035
Only mother has more than ISCED 1-2	0.097**	0.015	0.100**	0.017	0.059**	0.017	0.097**	0.018
Both have more than ISCED 1-2	0.330**	0.010	0.339**	0.011	0.255**	0.013	0.340**	0.011
Only father > ISCED 1-2* parental separation			0.004	0.030	0.002	0.030	0.003	0.035
Only mother > ISCED 1-2* parental separation			−0.018	0.036	−0.040	0.037	−0.025	0.042
Both more than ISCED 1-2* parental separation			−0.064*	0.030	−0.070*	0.029	−0.069*	0.031
Mother's psychological problems at age 5					−0.009	0.006		
Child's behavioural problems at age 5					−0.014**	0.005		
Child's cognitive ability at age 5					0.062**	0.004		
Material resources at age 5					0.027**	0.006		
Constant	0.143**	0.006	0.139**	0.007	0.168**	0.007	0.122**	0.008
N	9,525		9,525		9,525		8,330	

*$P < 0.05$, **$P < 0.01$. Multiple imputation used for missing values on independent variables.

parental education on CSE/O-levels grades at age 16 (Model 5), and on making the transition to A-levels at age 16 (Model 6). The results reveal only negligible differences in the effects of parental separations on grades at age 16 according to parental education. Additional analysis based on individual fixed effects models for cognitive outcomes at ages 5, 10, and 16 (Supplementary Appendix C) found no effects of parental separation on cognitive ability either.[7] Model 6, on the other hand, shows that it is the probability of making the transition to A-levels, which is affected differently by parental separation depending on parental education.

We perform our 'parental separation placebo test' to look at the possible role of endogeneity in our results on school grades and the transition to A-levels. Models 7 and 8 of Table 3 display the effects of parental separations that took place between ages 17 and 19, hence, after the exams were taken and final post-compulsory education decisions made. Again no heterogeneity in the effect of parental separation by social background is found in the case of school grades at age 16. The most notable result of the placebo test is, however, that the parental separation penalty for both children of highly educated and less educated parents vanishes for the transition to A-Levels. If pre-existing unobserved characteristics (for instance, parental conflict) are responsible for the heterogeneity in effects of parental separation documented in Table 2, similar differences in the outcomes studied should already be visible in the years immediately preceding parental separation (i.e. at age 16). The absence of such a pattern suggests that heterogeneity in the effects of parental separation on the transition to A-levels is not driven by unobserved characteristics that are relatively stable over time (but, see footnote 6). The influence of unobserved time-varying characteristics on our estimates cannot however be excluded. We discuss issues of endogeneity further in Supplementary Appendix C.

Mechanisms

Our previous analysis has aimed to reduce concerns that endogeneity is driving heterogeneity in the effects of parental separation on educational outcomes at age 16. In this section, we focus again on tertiary education and investigate two other possible underlying mechanisms: post-separation family relations and economic resources. Table 4 displays five models. The first model is our baseline model from Table 2. Model 9 contains our measures of economic resources at age 16, which explain part of the main effect of parental separation, and

Table 3. The effect of parental separation on school grades and educational transitions at age 16, LPM/OLS models

	School grade percentile at age 16		Made transition to A-Levels at age 16		School grade percentile at age 16 'Placebo test'		Made transition to A-Levels at age 16 'Placebo test'	
	Model 5		Model 6		Model 7		Model 8	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Family situation (Ref. Intact two-parent family at 16)								
Parental separation between age 5 and 16	−0.028	0.021	−0.040†	0.021	−0.025	0.020	−0.038†	0.021
Parental separation 'placebo' (between age 17 and 19)					−0.005	0.039	−0.007	0.041
Parental education (Ref. Both ISCED 1-2)								
Only father has more than ISCED 1-2	0.049**	0.012	0.098**	0.015	0.047**	0.012	0.100**	0.016
Only mother has more than ISCED 1-2	0.076**	0.015	0.120**	0.020	0.074**	0.015	0.120**	0.020
Both have more than ISCED 1-2	0.144**	0.010	0.325**	0.013	0.144**	0.010	0.325**	0.014
Only father > ISCED 1-2* parental separation 5 to 16	0.009	0.033	−0.045	0.039	0.009	0.034	−0.047	0.039
Only mother > ISCED 1-2* parental separation 5 to 16	0.002	0.038	−0.021	0.047	0.004	0.037	−0.021	0.047
Both more than ISCED 1-2* separation 5 to 16	−0.021	0.028	−0.080*	0.034	−0.024	0.028	−0.082*	0.033
Only father > ISCED 1-2* parental separation 17 to 19					0.067	0.073	–0.079	0.089
Only mother > ISCED 1-2* parental separation 17 to 19					0.071	0.080	0.001	0.100
Both more than ISCED 1-2* separation 17 to 19					–0.018	0.050	–0.003	0.066
Constant	0.448**	0.007	0.318**	0.009	0.447**	0.008	0.317**	0.009
N	6,699		9,795		6,699		9,795	

Note: Cases excluded with missing values on dependent variables. LPM with robust standard errors (A-Levels)/OLS (grades)., $^{\dagger}P < 0.10$, $^{*}P < 0.05$, $^{**}P < 0.01$. Controls of Model 3 included in Models 5–8 but not shown. Multiple imputation used for missing values on independent variables.

Table 4. LPM models explaining attainment of tertiary education (N = 9,525)

	Attainment of tertiary education		Attainment of tertiary education		Attainment of tertiary education		Attainment of tertiary education	
	Model 3		Model 9		Model 10		Model 11	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Family situation (Ref. Intact two-parent family)								
Parental separation between age 5 and 16	−0.037*	0.01	−0.020	0.01	−0.013	0.01	−0.023	0.02
Parental education (Ref. Both ISCED 1-2)								
Only father has more than ISCED 1-2	0.051**	0.01	0.038**	0.01	0.030*	0.01	0.040**	0.01
Only mother has more than ISCED 1-2	0.059**	0.02	0.045**	0.02	0.037*	0.02	0.047**	0.02
Both have more than ISCED 1-2	0.255**	0.01	0.213**	0.01	0.198**	0.01	0.187**	0.01
Only father more than ISCED 1-2*parental separation	0.002	0.03	0.005	0.03	0.030	0.03	0.003	0.03
Only mother more than ISCED 1-2*parental separation	−0.040	0.04	−0.033	0.02	−0.037	0.04	−0.030	0.04
Both more than ISCED 1-2*parental separation	−0.070*	0.03	−0.060*	0.03	−0.061*	0.03	−0.033	0.03
Material Resources age 16			0.006	0.01	0.002	0.01	0.004	0.01
Standardized annual household income age 16			0.054**	0.01	0.051**	0.01	0.020†	0.01
Parent–child relationship age 16					0.010	0.01	0.010	0.01
Parents visit school age 16					0.071**	0.01	0.070**	0.01
Parental monitoring age 16					0.029**	0.01	0.029**	0.01
Annual Income age 16* father > ISCED 1-2							0.003	0.02
Annual Income age 16* mother > ISCED 1-2							0.022	0.02
Annual Income age 16* both parents > ISCED 1-2							0.062**	0.02
Constant	0.168**	0.01	0.183**	0.01	0.153**	0.01	0.143**	0.01
N	9,525		9,525		9,525		9,525	

Note: Controls of Model 3, Table 2 included in Models 9–11 but not shown., LPM with robust standard errors., $^{\dagger}P < 0.10$;, $^{*}P < 0.05$;, $^{**}P < 0.01$. Multiple imputation used for missing values on independent variables.

a small part of heterogeneity in effects. When adding measures of family relations at age 16 (parental monitoring, school visiting, and parent–child relationship) in Model 10, results did not change. Another way through which family relations could affect the results is through post-separation family structure, but additional analysis found no role for it.[8]

We continued by looking at interaction effects of family relations and economic resources with educational background. As discussed in our theory section, parents could differ in the extent to which resources are deployed to invest in education of their children. Of all interaction effects with parental education, only the interaction with income was statistically significant (available upon request). To illustrate variation in the effects of household income at age 16, we plotted the average levels of family income for four different groups (highly educated intact, highly educated separated, low educated intact, low educated separated) on a line graph in Figure 1, displaying how the probability of attaining a university degree (Y axis) varies by family income at age 16 (X axis). Figure 1 shows that the association between family income and tertiary education attainment is stronger in the middle of the income distribution. Intact families where both parents have no qualifications (solid line) already seem to be situated, on average, below the part of the income distribution where income is more strongly associated with university attainment. Additional losses[9] in income due to parental separation are therefore relatively inconsequential for tertiary education attainment. Intact families where parents are highly educated, on the other hand, are on average situated on the part of the income distribution where changes in income matter most for educational attainment (dot-dashed line for intact families and dashed line for non-intact). Changes in income induced by parental separation are therefore likely to be more consequential for children's educational attainment if both parents are highly educated.

Once the interaction effect of annual income with parental education is included in our models of Table 4

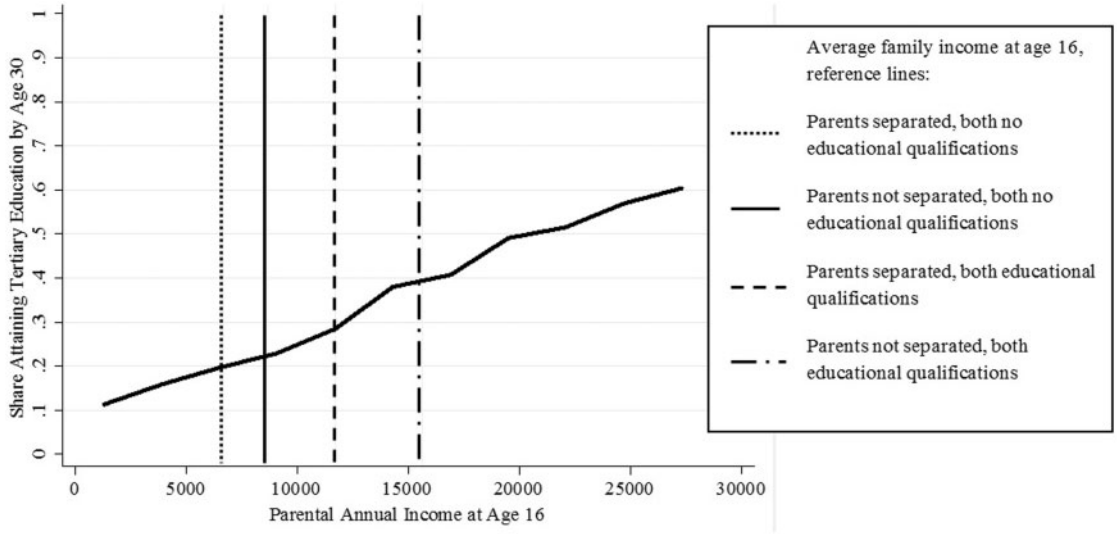

Figure 1. Share attaining tertiary education by parental income at age 16, including vertical reference lines reflecting average income by parental separation and education status.

(Model 11) more than half of the heterogeneity in separation penalties is explained.[10] The difference in the probability of attaining a university degree between children of highly educated parents in intact versus separated families is now only around 5.5 percentage points (it was about 11 percentage points in Model 3).

Family income thus plays a key role in explaining the heterogeneous effects of parental separation on attaining university education. A small part of heterogeneity can be explained by family income in general and lower levels of post-separation family income have more consequences for children of advantaged backgrounds compared to those from lower educated backgrounds.

Discussion

We start by recapping our main findings. First, we have shown for the 1970 British birth cohort that the children of separated parents have, on average, an 8 percentage point lower probability of obtaining a tertiary education qualification by age 30. However, this 'parental separation penalty' is not the same across all types of families: it is larger for the children of highly educated parents (about 13 percentage points) than for the children of less educated parents (about 6–7 percentage points). Secondly, we have also documented a larger parental separation penalty for children of highly educated parents on the likelihood of continued participation in academic education beyond compulsory school age, but not in terms of school grades at age 16. These findings are based on analyses that addressed the potential endogeneity of parental separation using different techniques, such as matching on observed pre-separation factors, individual fixed effect models, and a 'placebo test'. Thirdly, the most important mechanism explaining heterogeneity in the parental separation penalty by educational level in relation to attainment of a university degree seems to be variation in family income associated with parental separation.

Our findings are in line with a floor effect explanation (Kalmijn, 2010; Bernardi and Radl, 2014). If a parental separation occurs, children from socio-economically advantaged families have more to lose in terms of economic resources. In the case of the 1970 British birth cohort, we have shown that lower levels of post-separation family income are particularly critical. Not only do the children of highly educated parents lose (on average) more, but a loss in income is more consequential for them because they lie on a part of the income distribution where changes in family income are more strongly related to higher education participation. For the children of less educated parents, lower levels of family income post-separation have little effect on attainment of a university degree, probably because their income is on average too low to invest in higher education to begin with. This argument would also suggest that no penalty should be observed for those at the very top of the income distribution. Indeed once we focused on the very top of the educational distribution (the 5 per cent of cases where both parents were university educated) we found less heterogeneity in effects.

The results of this article help re-align results from previous studies on the consequences of parental separation for children. Earlier research on heterogeneity in effects of parental separation has sometimes found contradictory results, with some studies finding those of advantaged backgrounds being affected more (Martin, 2012) and others finding the opposite pattern (Grätz, 2015). Studies of the former category tended to look at educational attainment, whereas studies in the latter category most often looked at academic results at school. In this article, we studied the effects of parental separation on final educational attainment that are channelled through school grades and effects that are channelled through educational transitions (transition to A-levels in our case). The former appeared not to be affected by parental separation in our study, whereas the latter were, suggesting that inconsistent results from earlier studies could be due to the choice of dependent variable. A fruitful avenue for future studies would be to look at a greater range of child outcomes. In additional analyses, we also looked at occupational attainment at age 30 and found the same results as those for university degree attainment (Supplementary Appendix H).

Finally, our findings speak to social stratification research. Various studies have documented that children from higher socio-economic backgrounds are affected less by disadvantageous characteristics and life events that might hinder their future prospects of educational attainment. These studies focused on disadvantageous characteristics and events experienced by children, such as age at school entry or grade retention (Bernardi, 2012; Bernardi & Grätz, 2015). Our study suggests, however, that if the disadvantageous event affects parents' resources, as is the case with parental separation, children from higher socio-economic background are likely to be more negatively affected. Therefore, whereas we observe a compensatory advantage for children of higher socio-economic backgrounds when the initial disadvantage refers to children themselves, we are likely to find the opposite pattern, i.e. a larger disadvantage for children of higher socio-economic backgrounds, when a negative event directly affects parental resources. Our study showed that economic resources in particular seem to be a key resource in that respect.

The importance of parental income in this study raises the question of to what extent results are generalizable to other countries and time periods. Single mothers are an economically vulnerable group in Britain and economic inequality is relatively high (Lewis, 1997; Del Boca, 2003; Smeeding, 2005). If economically advantaged children are more likely to go to university in Britain, lower levels of family income following separation will have the greatest consequences for socio-economically advantaged children.[11] In countries where the economic position of single mothers is relatively better, it could therefore be that smaller or no heterogeneity in effects of parental separation on educational attainment are observed.

Notes

1 A similar finding surfaced in studies analysing how the divorce penalty varies among ethnic groups, showing more negative consequences among native children when compared to those of ethnic minorities (Kalmijn, 2010) or among white compared to black children in the United States (Brown, 2010).

2 We used the age 30 wave due to particularly low response rates at age 26.

3 See Supplementary Appendix D for more information.

4 In a complementary analysis discussed in Supplementary Appendix C we contrasted the effects of parental separation with those of being born into a single parent family and parental death. Results for children born into a single parent family were similar to those for parental separation, whereas for parental death most effects disappeared. This result is in line with previous findings that suggest that parental absence per se does not affect child outcomes (Diekmann and Engelhardt, 1999).

5 In additional analysis, reported in Supplementary Appendix G, we also looked at the influence of more general pre-existing differences in parental investments in children at age 5, but found them to have no impact on the results.

6 An important assumption of our placebo test is that the determinants of parental separation do not differ by children's age. Additional analysis, displayed in Supplementary Appendix Table C2, revealed that parents who separated when children were between 5 and 16 years are very similar on a set of observables compared to parents who separated while their child was between 17 and 19 years old.

7 As shown in Model 3 in Supplementary Appendix G, grades at age 16 explain little of our heterogeneity patterns observed for tertiary degree attainment at age 30.

8 In additional analysis, reported in Supplementary Appendix E, we looked at whether living with the father instead of with the mother, or living with a step-parent following separation explains the heterogeneity pattern found for the 'parental separation penalty'. The results reveal, first, that no major differences by parental education exist in the likelihood of living with the father or with a step-parent following separation, and, second, that negative effects of parental separation on children s educational attainment are observed for all post-separation family structures.

9 We are aware that we do not look at changes in income over time. However, for a sub-sample of parental separations that took place between ages 10 and 16, we were able to look at changes in family income pre- and post-separation. These analyses confirmed large and statistically significant drops in income that were larger for highly educated parents (available upon request).

10 We did not find signs of multicollinearity once estimating the Variation Inflation Factor (VIF) of each variable on the first imputed data set (highest VIF was for the main effect of weekly income: 4.76).

11 Our findings could be specific to the time period studied. For the cohort studied, the processes under study (i.e. parental separation and educational attainment) took place in the 80s. In 2015, compulsory education has been extended to age 18 and since 2012 university tuition fees have gone up. But, children with divorced parents have also been allowed to determine their eligibility for grants based on the income of one parent only. http://www.theguardian.com/money/2014/jan/26/wealthy-students-grants-poor-divorce.

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Supplementary Data

Supplementary data are available at *ESR* online.

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